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ABSTRACT

What is the nature and role of reflection for teachers? How is teacher reflection influenced by environmental/situational factors? Examination of stated beliefs and observed practices of four 7th and 8th grade mathematics classroom teachers were used as evidential sources to help answer these questions in this interpretive investigation. Multiple data sources revealed classroom settings elicited mostly spontaneous, technically oriented reflections, while reflections in the interview setting were more personally focused. An analysis of the teachers' metaphorical language indicated that reflections could be increased through the influence of a conflicted educational context and inhibited by deep level belief structures that limited the scope of reflections. (Author)

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AN INVESTIGATION OF TEACHER REFLECTION: FOUR MATHEMATICS TEACHERS REFLECT ON EDUCATION

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What is the nature and role of reflection for teachers? How is teacher reflection influenced by environmental/situational factors? Examination of stated thoughts and observed practices of four 7th and 8th grade mathematics classroom teachers were used as evidential sources to help answer these questions in this interpretative investigation. Multiple data sources revealed classroom settings elicited mostly spontaneous, technically oriented reflections, while reflections in the interview setting were more personally focused. An analysis of the teachers' metaphorical language indicated that reflections could be increased through the influences of a conflicted educational context and inhibited by deep level belief structures that limited the scope of reflections.

How can mathematics teachers promote professional growth through educational experiences and at the same time address a changing world? Wheatley (1992) suggests learning organizations that respond effectively to changing conditions are comprised of members who constantly process new information "with high levels of self-awareness, plentiful sensing devices, and a strong capacity for reflection" (p. 91). For schools to be true learning organizations, they not only need access to new information but they also need to be comprised of individuals with a particular propensity toward shared reflection based on action and a dynamic view of learning.

The investigation reported in this article was conducted during the 1993-1995 school years. The focus of the study was the nature, role, and relationship to external contexts of teacher reflection. Reflection was defined to be a self-informative analytic process which involves active, persistent and careful consideration of beliefs or 'knowledge.' Through reflection, one holds images and ideas in conscious awareness so they can be interconnected or transformed. Not only does reflection make possible the biological survival of mankind by making possible the adaptation to external changes but it aids in the construction of ideas out of an unlimited supply of potentials.

The importance of teacher reflection is not a new concept in education. Dewey, in 1933, wrote that teachers must avoid acting purely according to impulse, tradition, and authority by becoming reflective inquirers. In the past 10 to 15 years, however, the number of research projects concerning teachers' reflections has steadily increased. This may be partly due to the acceptance of interpretative research as a legitimate research approach thus making the study of complex phenomena, such as reflection, possible. Other factors contributing to the increased interest in teacher reflection include the emphasis placed on the role of reflection according to constructivist theory.

Observations of and interviews with four mathematics teachers (Rose, Belle, Christy, and Joan*) were the primary sources used in the data analysis. These

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* denotes pseudonym

teachers taught at Central City Junior High,* a traditional midwestern school with many common constraints on reflection including isolationism and limited built-in time for teacher reflection.

Theoretical Framework

The theoretical framework used to guide this exploration was based on the work of numerous constructivist theorists, primarily Piaget (1971), O'Loughlin (1992), and Prawat (1993) and the work of philosophers Lakoff and Johnson (1980), Johnson (1987,1993), and Habermas (1971). Analyses of the role and nature of teacher reflection relied heavily on Habermas' three fundamental human interests: technical, practical, and emancipatory. Habermas believed that individuals relate to the world from one of these interests and that much of their thoughts and actions are directed from one of these underlying world views. Teacher participants' statements and actions were considered with respect to their focus on control (central to the technical interest), clarification and understanding (practical interest), or challenging the assumptions of existing systems and the status quo (emancipatory interest).

Research Questions

The guiding questions in this investigation were: (1) What is the nature of the teacher participants' reflections? (2) What role does reflection play for the teachers as they deal with the complexity of teaching?, and (3) What are the environmental/situational factors which influence the teachers' stated reflections, and observed decisions and practices?

Procedures

Multiple data sources were acquired through five months of bi-weekly classroom observations and a weekly individual interview. Five reflective strategies: researcher observation feedback, oral autobiography, personal journals, audio tapes, and video tapes were used during this time as tools to aid teacher reflection. Approximately one year after the study was completed, the researcher conducted a follow-up telephone interview with the four teacher participants to ascertain which educational experiences following the study had provided additional opportunities for reflection.

Applying a constant comparative method (Glaser & Strauss, 1967), categories from the data were developed with respect to the research question concerning the role of teacher reflections. Three other analyses aimed at clarifying the nature of teacher reflections were made. Researcher tools were developed for these analyses based on the work of Louden (1992), Van Manen (1991) and a synthesis of metaphorical research based primarily on work reported by Lakoff and Johnson (1980) and Johnson (1987, 1993).

Conclusions and implications

The Nature of Teacher Reflections

Multiple data sources revealed classroom settings elicited primarily spontaneous, technically oriented reflections. Teachers used reflection in three ways: to make instructional adjustments, conduct on-the-spot assessments of their instruction, and make classroom management decisions.

Teacher reflections in the interview setting were more recollective and personally focused. They helped the teachers analyze themselves, make assessments, process their pasts and anticipate the future.

Contrary to beliefs held by Van Manen and Habermas, it appeared that teacher interests (philosophical orientations) were not solely internal phenomenon but were interactive, dynamic, and sensitive to external circumstances. For example, Joan's intention to represent mathematics not only as a set of rules but also as a discipline that dealt with non-routine, open-ended problems called for both technical and practical interests to be expressed at various times. Belle also expressed a combination of interests in the classroom. At the beginning of her classes she would often display a practical interest as she chatted with her students about their personal concerns, however, when she instructed the students on mathematical concepts and procedures a more technical interest was evident.

Critical theorists have expressed concern that teachers' intentional reflections are too often focused on issues that relate to the immediate demands of their classrooms rather than to external contexts or visions of possibilities of educational alternatives (Grundy, 1987, Smyth, 1992; Zeichner, 1993). These concerns seemed to be legitimized by findings in this study which revealed the teacher participants were too close to their students and instructional situations to be able to be actively introspective.

The Role of Teacher Reflections

The role reflection played for the participants was found to be strongly affected by individual reflection tendencies. Personal philosophy, goals, interests, beliefs, concerns, personal teaching style and environmental influences were some of the factors that influenced these individual differences.

The role of reflection in the interview sessions functioned differently than ongoing reflection in the classroom. In the interview setting teachers used reflections to help them deal with more internal issues. For instance, it was not uncommon for the teachers to discuss conflicted feelings they had about the lack of support from parents and school board members. Opportunities for inward focused reflections were rare in the classroom because the participants had not structured their classes in ways that would allow them to stand outside the action.

Environmental/Situational Factors

The metaphorical analysis of interview data provided insights with respect to focus and increased activity of reflections. The metaphorical language used by the teachers not only demonstrated their concerns but magnified issues that for them were emotionally charged. For example, the emotional reactions to the conflicts experienced within the Central City community over OBE resulted in increased teacher reflective activity and was revealed through the war metaphors they used. The teachers made comments like: "We're fighting this survival battle." "I was just being shot down all over the place." "Sound practices are being challenged."

An additional benefit gained from the metaphorical analysis was an indication of teacher beliefs that might suggest "blind spots" to teacher reflection. Teaching metaphors like: "mathematics is a building-type skill" that has to be "gotten across" to students who may turn into "spoon-fed robots" helped to illustrate how the scope of teacher reflections can become limited due to deep-level belief structures.

Summary

Reflective practice is not a panacea that will solve all the problems of education. However, it is key to most processes and programs designed to meet educational challenges and change. The systematic use of reflection helps teachers combine and integrate their past experiences with current knowledge and information enabling them to respond more effectively to current educational demands. By making explicit those personal theories of knowledge and actions that have been implicit, teachers may confront practice on their own terms and confirm strengths and weaknesses. Appreciating the complexity of teaching and gaining a clearer understanding of their own framework through reflective thought may enable teachers to discuss with others what they believe and explain why they are doing what they are doing in the classroom (Cornet, et al., 1992).

Bureau (1993) argues that for a radical reform of contexts and school structures three issues must be addressed: time, social structures, and social contexts. However, Grant and Zeichner's (1984) findings suggest setting aside time for teachers to reflect does not guarantee productive reflective activity will occur. Those interested in supporting teacher growth through reflective means should be aware that the outcomes of reflective activity may not always be perceived as positive. Teachers may become dissatisfied with current teaching conditions, challenge traditional structures, seek more power and demand a voice in important issues. What this investigation does not intend to suggest is that reflective teachers working alone can tackle the complexities of teaching single-handedly.

Reflection appears to be a key process in promoting the kinds of change in mathematics teaching being promoted by organizations like the National Council of Teachers of Mathematics. What has been learned from this investigation is that any effort to promote reflection needs to (a) be non-coercive, (b) offer a variety of opportunities for reflection, (c) involve social interactions, and (d) be responsive and flexible. By helping mathematics teachers stay open to new information

and, at times, off balance (disequilibrium), and by encouraging them to reflect on new information, positive change in mathematics instruction becomes possible. With growth comes the increased likelihood that teachers will be able to think and teach in ways that appropriately meet the needs of a changing world (Wheatley, 1992). Future research goals include exploring some of the more exciting potentials offered by various forms of reflective communities.

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